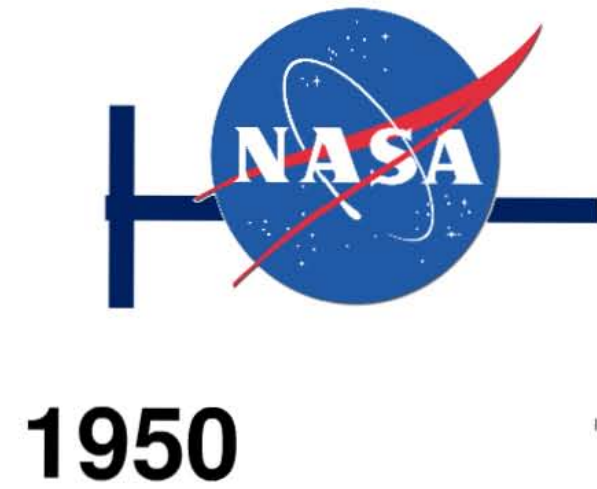


The Longitudinal Study of Astronaut Health is an epidemiological study conducted from

- Examine the mortality and morbidity of astronauts
- Determine the rate of illness and accidents that require medical care





1960



Project
Mercury



Project
Gemini

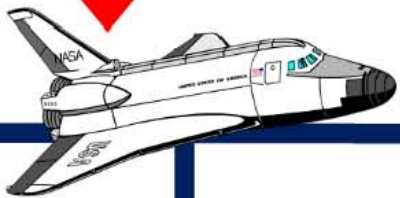
1970



Project
Apollo

Skylab

The Belmont
Report



The Common
Rule



Electronic Medical
Record



Health Insurance
Portability and
Accountability Act



1980

1990

2000

2010

2020



1981-2011

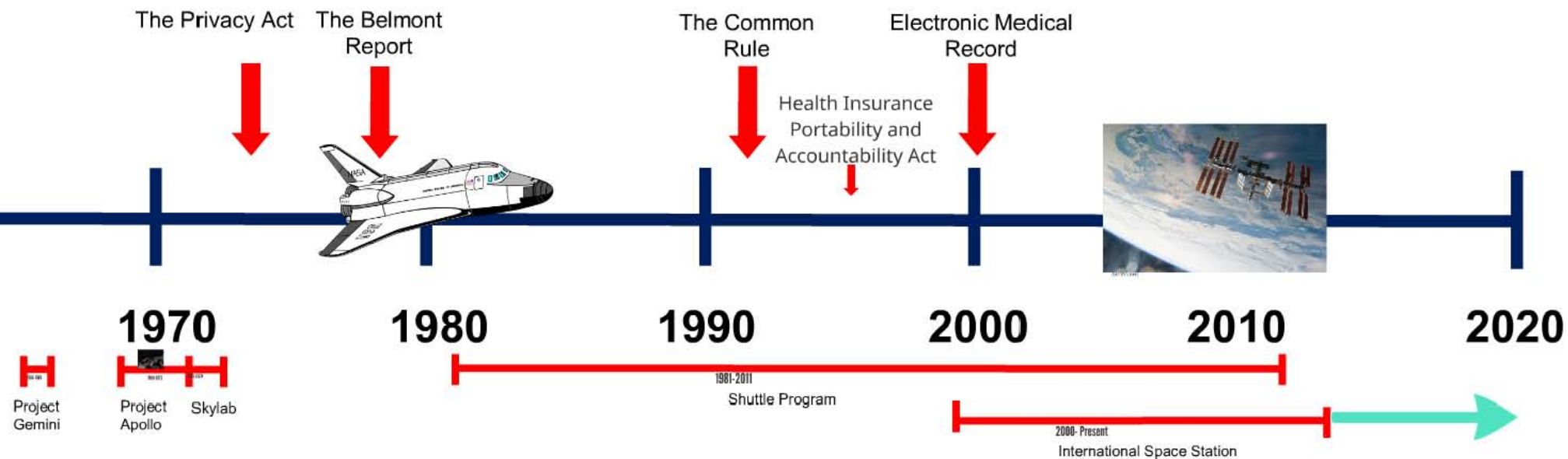
Shuttle Program



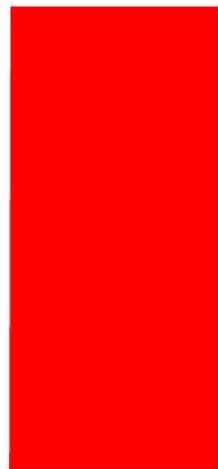
2000- Present

International Space Station





Electronic Medical Record



ranra

The Longitudinal Study of Astronaut Health (LSAH) was an epidemiological study conducted from 1991-2010

- **Examine the mortality and morbidity rates of astronauts**
- **Determine the rate of illness and accidents which require medical care**
- **Establish a comprehensive database**



LSAH Command Center

Enter user credentials:

User Name:

Password:

Location:

LSAH Database ▼

OK

Close

1



This is ONE patient's medical chart!!!

In the late 90's NASA transitioned from traditional paper charts to an Electronic Medical Record system which improved the overall quality of care for astronauts in-flight and on the ground



Flight Medicine
Clinic EMR
Established

Summer 1999

Clinical Lab
Results

Spring 2000

Annual and
Mission Physical
Examinations

Fall 2000

Consultant
Reports

Fall 2004

Ongoing
Development of
Data Collection

Fall 2004 - Present

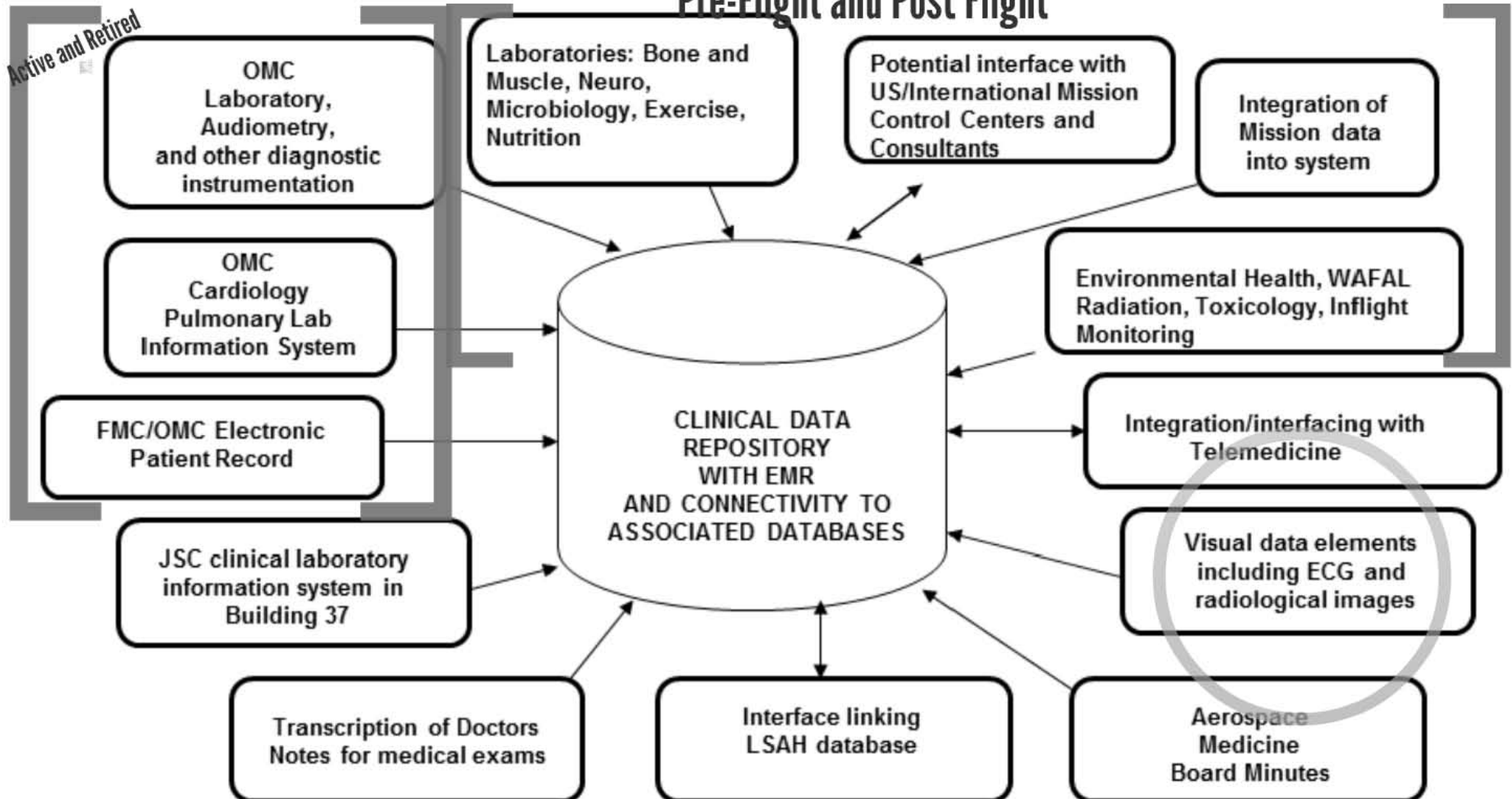


EMR Requirements

- **Ambulatory**
- **Scalable**
- **Very Customizable**

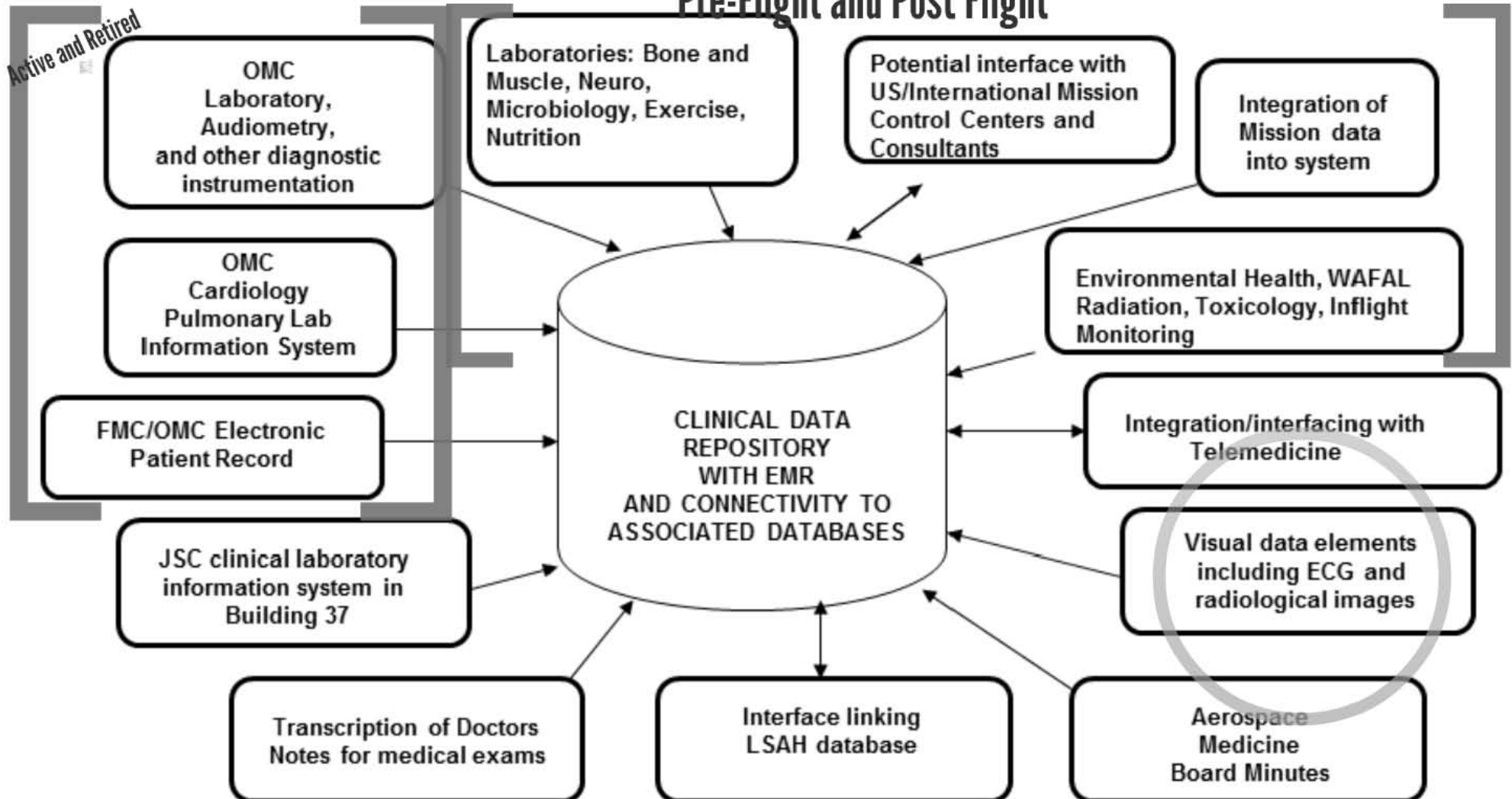
Pre-Flight and Post Flight

Active and Retired



Pre-Flight and Post Flight

Active and Retired





Active and Retired



1. Name	
2. Address	
3. City	
4. State	
5. Zip	
6. Phone	
7. Email	
8. Date	
9. Signature	
10. Initials	
11. Date	
12. Signature	
13. Initials	
14. Date	
15. Signature	
16. Initials	
17. Date	
18. Signature	
19. Initials	
20. Date	

	Active Annual	Retired Annual
Aerobic Functional Capacity	X	
Audiometry	X	X
Bone Densitometry (DXA)	Every 3 yrs	Every 3 yrs
Cardiology	X	Per guidelines
Clinical Assessment	X	X
Colonoscopy	Age-based	Age-based
Dental Exam	X	X
Dermatology Screen	X	X
Gynecological Exam	X	X
Laboratory Testing	X	X
Neurovestibular Testing		
Nutritional Assessments	X	As desired
Occupational Health History	X	X
Ophthalmology Examination & Imaging	X	X
MRI & Ultrasound of the Eye & Orbits	X	
Psychiatric & Psychological Evaluation	X	
Pulmonary Function Testing	X	X
Radiation Monitoring/Biodosimetry	Update	
Ultrasound Imaging	X	Per guidelines

Pre-Flight and Post Flight

Laboratories: Bone and Muscle, Neuro, Microbiology, Exercise, Nutrition

Potential interface with US/International Mission Control Centers and Consultants

Integration of Mission data into system

Environmental Health, WAFAL Radiation, Toxicology, Inflight Monitoring

Integration/interfacing with Telemedicine

Visual data elements including ECG and

CLINICAL DATA
REPOSITORY
WITH EMR
AND CONNECTIVITY TO
ASSOCIATED DATABASES

```
graph TD; Lab[Laboratories: Bone and Muscle, Neuro, Microbiology, Exercise, Nutrition] --> CDR[(CLINICAL DATA REPOSITORY WITH EMR AND CONNECTIVITY TO ASSOCIATED DATABASES)]; PIMCC[Potential interface with US/International Mission Control Centers and Consultants] <--> CDR; IM[Integration of Mission data into system] --> CDR; EHT[Environmental Health, WAFAL Radiation, Toxicology, Inflight Monitoring] --> CDR; IT[Integration/interfacing with Telemedicine] <--> CDR; VDE[Visual data elements including ECG and] --> CDR;
```

[illegible]

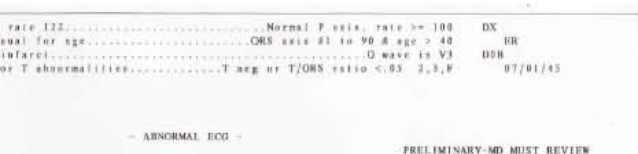
Integration/Interfacing with
Telemedicine

Visual data elements
including ECG and
radiological images

Aerospace

Picture Archive and Communication System (PACS)

- Increased use of imagery for screening due to long duration space flight
- Clinical care function needed to maintain internal and external diagnostic imaging within NASA Medical Systems
- Consistent with NASA's retention guidelines

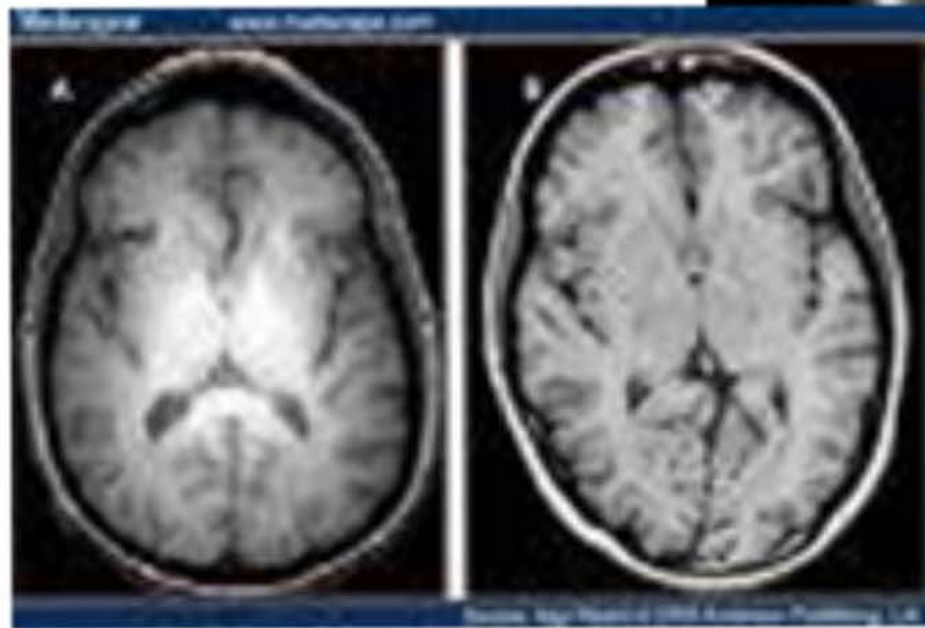
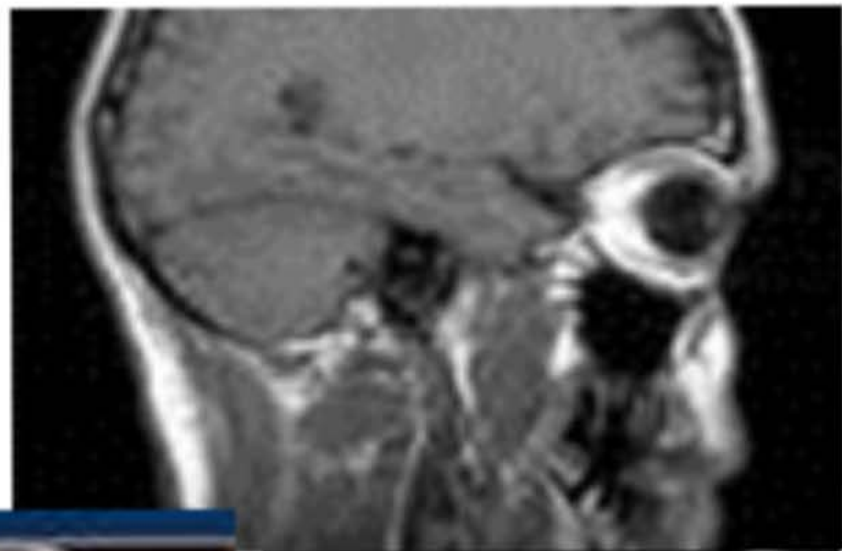


DX
ER
DOB 07/01/45

PRELIMINARY-MD MUST REVIEW







Approximately 800 external MRI, CT, and X-Ray studies have been imported into PAC

X-Ray studies have been imported into PAC

Shuttle Data Archive

- Captures original Shuttle program health and human performance records from Space Medicine
- Designed to be expandable to other programs



Assessment and Planning

- ✓ Reviewed content and business processes
- ✓ Created a detailed inventory
- ✓ Assessed current systems
- ✓ Conducted interviews (25+ people)
 - Variety of levels / titles
 - SD, IRD (RM, STI, KM), SF
- ✓ Developed detailed plan, budget, solution requirements
- ✓ Hired staff

Data Collection, Governance Design, and Preparation

- ✓ Developed standards, guidelines, and procedures
- ✓ Defined content organization
- ✓ Inventoried and organized the Medical Operations store room
- ✓ Researched / assessed conversion vendors
- ✓ Collected, reviewed categorized content collected from flight surgeons
- ✓ Prepared content for conversion
- ✓ Designed repository solution

Solution Implementation, Data Conversion and Load

- ✓ Selected conversion vendors
- ✓ Converted content
 - ✓ ~340,000 pages
 - ✓ 1173 audio tapes/reels
 - ✓ 28 video tapes
 - ✓ 16 motion film reels
 - ✓ 34 still image items
- ✓ Enrich content metadata
- ✓ Implement solution
- ✓ Load ~36,000 files & metadata
- ✓ Validate solution and data
- ✓ Effect governance standards and guidelines
- ✓ Training
- ✓ Planning for Post-Project sustainability



January
2009

August
2009

January
2010

September 2011



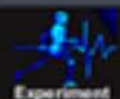
NASA's Life Sciences Data Archive (LSDA)

- An active archive that provides information and data from 1961 through current flight and flight analog studies
- Information and data are publicly available on website.

[HOME](#)[FOR RESEARCHERS](#)[FOR EDUCATORS](#)[FOR STUDENTS](#)[FOR EVERYONE](#)

Life Sciences Data Archive @ Johnson Space Center, Houston, Texas

FIND IT @ NASA:

[Search](#)Search Publicly Available Information and Data [Experiment](#)[Mission](#)[Personnel](#)[Biospecimens](#)[Documents](#)[Hardware](#)[Dataset](#)[Photo Gallery](#)

NASA Research Announcement

Released July 30, 2012: NASA Research Announcement NNJ12ZSA002N Research and Technology Development to Support Crew Health and Performance in Space Exploration Missions [Full announcement](#).

NASA Human Research Program (HRP)

NASA's Human Research Program (HRP) conducts research and develops technologies that allow humans to travel safely and productively in space. The Program uses evidence from data collected on astronauts, as well as other supporting studies. These data are stored in the research data repository, Life Sciences Data Archive (LSDA).

[HRP Home](#)[Human Research Roadmap](#)[Evidence Book](#)[Education & Outreach](#)[Research Data Repository: Life Sciences Data Archive \(LSDA\)](#)[Space and Clinical Operations](#)[Medical Data Repository: Lifetime Surveillance of Astronaut Health \(LSAH\)](#)[Missions or Studies in Progress](#)[Expedition 36](#)[+ Learn more](#)[ROI](#)[+ Learn more](#)[ECP](#)[+ Learn more](#)[Campaign 11](#)[+ Learn more](#)

Data Request



Data can be requested from one or both repositories.

Images Added to the Archive



Missions in Progress

[Expedition 36](#)[+ Learn more](#)

Operational use of Data:

- **Clinical**
- **Operational**
- **Occupational**
- **Research**
- **Other**



Clinical

NASA Physicians requesting data for direct care of patient(s)

Operational

Address specific NASA programmatic or decision support needs

Occupational

Identify trends in data or adverse health outcomes related to spaceflight and spaceflight training

Research

- Generally hypothesis-driven investigations – currently ~65% of all DRs
- HRP-funded are top research priority

Other

Processed as staff have availability,
prioritized by EBWG (de-identified),
LSAH AB (attributable), other
management as required

Operational use of Data:

- **Clinical**
- **Operational**
- **Occupational**
- **Research**
- **Other**



Human Research Roadmap

[Explore the Roadmap](#)[Search the Roadmap](#)[HRP Architecture](#)

Crew health and performance is critical to successful human exploration beyond low Earth orbit. The Human Research Program (HRP) investigates and mitigates the highest risks to human health and performance, providing essential countermeasures and technologies for human space exploration. Risks include physiological effects from radiation, hypogravity, and terrestrial environments, as well as unique challenges in medical support, human factors, and behavioral health support. The HRP utilizes an Integrated Research Plan (IRP) to identify the approach and research activities planned to address these risks, which are assigned to specific Elements within the program. The Human Research Roadmap is the web-based tool for communicating the IRP content.



Developer: Joshua Foster
NASA Official: Robert Galvez

• Budget, Strategic Plans, and Accountability Reports
• Equal Employment Opportunity Data Posted Pursuant to the No Fear Act
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• Contact HRP
• Human Health and Performance DRI
• Johnson Space Center
• USAGov
• [ExploreMore.gov](#)